Appl. No. : 10/074,564
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AMENDMENTS TO THE CLAIMS

Please amend Claims 1, 5, 6, 9, 14, 15, 17, 20, 27, and 70; cancel Claims 2-4, 32, 47-50, 69, 71 and 76-80, and add new Claims 81-84, as follows:

1. (Currently amended) A method for depositing a thin film, comprising:

introducing a gas comprising trisilane to a chamber, wherein the chamber contains a substrate having a surface area of about 300 cm^2 or greater and a substrate surface roughness;

establishing trisilane chemical vapor deposition conditions in the chamber; and

depositing [[a]] an amorphous Si-containing film onto the substrate, the Si-containing film having a thickness in the range of 10 Å to 150 Å and a film surface roughness that is greater than the substrate surface roughness by an amount of about 5 Å rms or less, over a surface area of about one square micron or greater.

2. (Canceled)

3. (Canceled)

4. (Canceled)

5. (Currently amended) The method of Claim [[2]] 1, wherein the Si-containing film is deposited directly onto a non-single crystal material.

6. (Currently amended) The method of Claim [[2]] 1, wherein the Si-containing film is deposited directly onto a dielectric material.

7. (Original) The method of Claim 6, wherein the dielectric material is selected from the group consisting of silicon oxide, metal oxide, metal silicate, silicon oxynitride and silicon nitride.

8. (Original) The method of Claim 6, wherein the film surface roughness is about 3 Å rms or less.

9. (Currently amended) The method of Claim [[2]] 1, further comprising depositing an oxide layer directly onto the Si-containing film.

10. (Original) The method of Claim 9, further comprising annealing the Si-containing film to form a plurality of quantum dots.

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11. (Original) The method of Claim 6, further comprising depositing a doped Si-containing layer directly onto the Si-containing film.

12. (Original) The method of Claim 11, wherein the doped Si-containing layer further comprises germanium.

13. (Original) The method of Claim 12, wherein the doped Si-containing layer further comprises carbon.

14. (Currently amended) The method of Claim [[2]] 1, wherein the Si-containing film has a thickness non-uniformity of about 10% or less for a mean film thickness in the range of 100 Å to 150 Å, a thickness non-uniformity of about 15% or less for a mean film thickness in the range of 50 Å to 99 Å, and a thickness non-uniformity of about 20% or less for a mean film thickness of less than 50 Å.

15. (Currently amended) The method of Claim [[2]] 1, wherein the substrate comprises a step or trench.

16. (Original) The method of Claim 15, further comprising annealing the amorphous Si-containing film to form hemispherical grained silicon.

17. (Currently amended) The method of Claim [[2]] 1, wherein the gas further comprises a dopant element selected from the group consisting of boron, arsenic, antimony, indium, and phosphorous.

18. (Original) The method of Claim 17, wherein the Si-containing film is a diffusion layer.

19. (Original) The method of Claim 17, wherein the depositing of the Si-containing film onto the substrate results in uniform incorporation of the dopant element throughout the Si-containing film.

20. (Currently amended) The method of Claim [[2]] 1, wherein establishing trisilane chemical vapor deposition conditions comprises heating the substrate to a temperature in the range of about 400°C to about 750°C in the absence of a plasma.

21. (Original) The method of Claim 1, wherein establishing trisilane chemical vapor deposition conditions comprises heating the substrate to a temperature in the range of about 450°C to about 650°C in the absence of a plasma.

22. (Original) The method of Claim 1, wherein the Si-containing film is a Si-N film.

23. (Original) The method of Claim 22, wherein the gas further comprises a nitrogen precursor.

24. (Original) The method of Claim 23, wherein the nitrogen precursor is atomic nitrogen.

25. (Original) The method of Claim 23, wherein the Si-containing film has a hydrogen content that is less than about 4 atomic %.

26. (Original) The method of Claim 1, wherein establishing trisilane deposition conditions comprises maintaining a chamber pressure between about 1 Torr and 100 Torr.

27. (Currently amended) A method for depositing a thin film, comprising:

introducing trisilane to a chamber, wherein the chamber contains a substrate having a surface area of about 300 cm^2 or greater; and

depositing a continuous amorphous Si-containing film having a thickness of less than about 100 Å and a surface area of about one square micron or larger onto the substrate by thermal chemical vapor deposition;

wherein the Si-containing film has a thickness non-uniformity of about 15% or less for a mean film thickness in the range of 50 Å to 99 Å, and a thickness non-uniformity of about 20% or less for a mean film thickness of less than 50 Å.

28. (Original) The method of Claim 27, wherein the substrate comprises a non-single crystal material.

29. (Original) The method of Claim 28, wherein the Si-containing film is deposited directly onto the non-single crystal layer and the non-single crystal layer is selected from the group consisting of silicon oxide, metal oxide, metal silicate, silicon oxynitride and silicon nitride.

30. (Original) The method of Claim 27, wherein the Si-containing film has a surface roughness of about 5 Å or less.

31. (Original) The method of Claim 27, wherein the substrate comprises a step or trench.

32. (Canceled)

33. (Original) The method of Claim 27, wherein the depositing is conducted at a temperature in the range of about 450°C to about 650°C.

34. (Original) The method of Claim 27, wherein the depositing is conducted in or near a mass transport limited regime for trisilane.

35. (Original) The method of Claim 34, wherein the continuous amorphous Si-containing film has a surface area of about five square microns or larger.

36. (Original) The method of Claim 27, further comprising depositing an oxide layer over the Si-containing film.

37. (Original) The method of Claim 36, further comprising annealing the Si-containing film to form a plurality of quantum dots.

38. (Original) The method of Claim 27, further comprising depositing a doped Si-containing layer directly onto the Si-containing film.

39. (Original) The method of Claim 38, wherein the doped Si-containing layer further comprises germanium.

40. (Original) The method of Claim 39, wherein the doped Si-containing layer further comprises carbon.

41. (Original) The method of Claim 27, further comprising annealing the amorphous Si-containing film to form hemispherical grained silicon.

42. (Original) The method of Claim 27, wherein the depositing is conducted at a temperature in the range of about 425°C to about 700°C.

43. (Original) The method of Claim 27, further comprising introducing a nitrogen precursor to the chamber.

44. (Original) The method of Claim 43, wherein the trisilane is introduced to the chamber in one or more pulses.

45. (Original) The method of Claim 44, wherein the nitrogen precursor is atomic nitrogen.

46. (Original) The method of Claim 45, wherein the depositing is conducted at a temperature in the range of about 450°C to about 650°C.

Claims 47 – 54 (cancelled)

55. (Previously presented) A method for depositing a thin film, comprising:

introducing a gas comprising trisilane to a chamber, wherein the chamber contains a substrate having a substrate surface roughness;

establishing trisilane chemical vapor deposition conditions in the chamber;

depositing an amorphous Si-containing film onto the substrate, the Si-containing film having a thickness in the range of 10 Å to 150 Å and a film surface roughness that is greater than the substrate surface roughness by an amount of about 5 Å rms or less, over a surface area of about one square micron or greater;

depositing an oxide layer directly onto the Si-containing film; and

annealing the Si-containing film to form a plurality of quantum dots.

56. (Previously presented) A method for depositing a thin film, comprising:

introducing a gas comprising trisilane to a chamber, wherein the chamber contains a substrate having a substrate surface roughness;

establishing trisilane chemical vapor deposition conditions in the chamber;

depositing a Si-containing film onto the substrate, the Si-containing film having a thickness in the range of 10 Å to 150 Å and a film surface roughness that is greater than the substrate surface roughness by an amount of about 5 Å rms or less, over a surface area of about one square micron or greater; and

depositing a doped Si-containing layer directly onto the Si-containing film;

wherein the Si-containing film is deposited directly onto a dielectric material.

57. (Previously presented) The method of Claim 56, wherein the doped Si-containing layer further comprises germanium.

58. (Previously presented) The method of Claim 57, wherein the doped Si-containing layer further comprises carbon.

59. (Previously presented) A method for depositing a thin film, comprising:

introducing a gas comprising trisilane to a chamber, wherein the chamber contains a substrate having a substrate surface roughness;

establishing trisilane chemical vapor deposition conditions in the chamber;

depositing an amorphous Si-containing film onto the substrate, the Si-containing film having a thickness in the range of 10 Å to 150 Å and a film surface roughness that is greater than the substrate surface roughness by an amount of about 5 Å rms or less, over a surface area of about one square micron or greater;

wherein the Si-containing film has a thickness non-uniformity of about 10% or less for a mean film thickness in the range of 100 Å to 150 Å, a thickness non-uniformity of about 15% or less for a mean film thickness in the range of 50 Å to 99 Å, and a thickness non-uniformity of about 20% or less for a mean film thickness of less than 50 Å.

60. (Previously presented) A method for depositing a thin film, comprising:

introducing a gas comprising trisilane to a chamber, wherein the chamber contains a substrate having a substrate surface roughness;

establishing trisilane chemical vapor deposition conditions in the chamber;

depositing an amorphous Si-containing film onto the substrate, the Si-containing film having a thickness in the range of 10 Å to 150 Å and a film surface roughness that is greater than the substrate surface roughness by an amount of about 5 Å rms or less, over a surface area of about one square micron or greater;

wherein the substrate comprises a step or trench.

61. (Previously presented) The method of Claim 60, further comprising annealing the amorphous Si-containing film to form hemispherical grained silicon.

62. (Previously presented) A method for depositing a thin film, comprising:

introducing a gas comprising trisilane to a chamber, wherein the chamber contains a substrate having a substrate surface roughness;

establishing trisilane chemical vapor deposition conditions in the chamber;

depositing an amorphous Si-containing film onto the substrate, the Si-containing film having a thickness in the range of 10 Å to 150 Å and a film surface roughness that is greater than the substrate surface roughness by an amount of about 5 Å rms or less, over a surface area of about one square micron or greater;

wherein the gas further comprises a dopant element selected from the group consisting of boron, arsenic, antimony, indium, and phosphorous.

63. (Previously presented) The method of Claim 62, wherein the Si-containing film is a diffusion layer.

64. (Previously presented) The method of Claim 62, wherein the depositing of the Si-containing film onto the substrate results in uniform incorporation of the dopant element throughout the Si-containing film.

65. (Previously presented) A method for depositing a thin film, comprising:

introducing a gas comprising trisilane to a chamber, wherein the chamber contains a substrate having a substrate surface roughness;

establishing trisilane chemical vapor deposition conditions in the chamber; and

depositing a Si-N film onto the substrate, the Si-N film having a thickness in the range of 10 Å to 150 Å and a film surface roughness that is greater than the substrate surface roughness by an amount of about 5 Å rms or less, over a surface area of about one square micron or greater.

66. (Previously presented) The method of Claim 65, wherein the gas further comprises a nitrogen precursor.

67. (Previously presented) The method of Claim 66, wherein the nitrogen precursor is atomic nitrogen.

68. (Previously presented) The method of Claim 66, wherein the Si-containing film has a hydrogen content that is less than about 4 atomic %.

69. (Canceled)

70. (Currently amended) A method for depositing a thin film, comprising:

introducing trisilane to a chamber, wherein the chamber contains a substrate; and

depositing a continuous amorphous Si-containing film having a thickness of less than about 100 Å and a surface area of about one square micron or larger onto the substrate by thermal chemical vapor deposition;

wherein the substrate comprises a step or trench and

wherein the Si-containing film has a thickness non-uniformity of about 15% or less for a mean film thickness in the range of 50 Å to 99 Å, and a thickness non-uniformity of about 20% or less for a mean film thickness of less than 50 Å.

71. (Canceled)

72. (Previously presented) A method for depositing a thin film, comprising:

introducing trisilane to a chamber, wherein the chamber contains a substrate;

depositing a continuous amorphous Si-containing film having a thickness of less than about 100 Å and a surface area of about one square micron or larger onto the substrate by thermal chemical vapor deposition;

depositing an oxide layer over the Si-containing film; and

annealing the Si-containing film to form a plurality of quantum dots.

73. (Previously presented) A method for depositing a thin film, comprising:

introducing trisilane to a chamber, wherein the chamber contains a substrate;

depositing a continuous amorphous Si-containing film having a thickness of less than about 100 Å and a surface area of about one square micron or larger onto the substrate by thermal chemical vapor deposition; and

depositing a doped Si-containing layer directly onto the Si-containing film.

74. (Previously presented) The method of Claim 73, wherein the doped Si-containing layer further comprises germanium.

75. (Previously presented) The method of Claim 74, wherein the doped Si-containing layer further comprises carbon.

76. (Canceled)

77. (Canceled)

78. (Canceled)

79. (Canceled)

80. (Canceled)

81. (New) A method for depositing a thin film, comprising:

introducing trisilane to a chamber, wherein the chamber contains a substrate having a surface area of about 300 cm^2 or greater; and

depositing a continuous amorphous Si-containing film having a thickness of less than about 100 Å and a surface area of about one square micron or larger onto the substrate by thermal chemical vapor deposition, wherein the depositing is conducted in or near a mass transport limited regime for trisilane.

82. (New) A method for depositing a thin film, comprising:

introducing trisilane to a chamber, wherein the chamber contains a substrate having a surface area of about 300 cm^2 or greater;

depositing a continuous amorphous Si-containing film having a thickness of less than about 100 Å and a surface area of about one square micron or larger onto the substrate by thermal chemical vapor deposition; and

depositing a doped Si-containing layer directly onto the Si-containing film, wherein the doped Si-containing layer further comprises germanium.

83. (New) The method of Claim 82, wherein the doped Si-containing layer further comprises carbon.

84. (New) A method for depositing a thin film, comprising:

introducing trisilane and a nitrogen precursor to a chamber, wherein the chamber contains a substrate having a surface area of about 300 cm^2 or greater; and

depositing a continuous amorphous Si-containing film having a thickness of less than about 100 Å and a surface area of about one square micron or larger onto the substrate by thermal chemical vapor deposition.